Information Systems and Economics (2025)
Clausius Scientific Press, Canada

DOI: 10.23977/infse.2025.060204
ISSN 2523-6407 Vol. 6 Num. 2

Design and Simulation of Financial Data Evaluation Algorithm Based on Machine Learning and 5G Cloud Computing Technology

Jincen Han[1,a,*]

[1]*Nanchong Vocational and Technical College, Nanchong, Sichuan, China*
[a]*595670113@qq.com*
[*]*Corresponding author*

Keywords: Cloud Computing Technology, Financial Management, Financial Data Quality Evaluation Model, Financial Management Information Construction

Abstract: In financial management, the management of financial data is particularly important. Financial data is a specific record of different economic activities and fund use of an enterprise, so it is often necessary to analyze, process and evaluate financial data. However, the traditional data analysis technology and evaluation method have many defects, and it is difficult to conduct comprehensive and detailed analysis and evaluation of financial data. In the era of technology, cloud computing technology (CCT) has been developed, which can be used to build cloud platforms and improve the efficiency of data analysis and processing. Therefore, this paper proposed to apply CCT to financial management and build a financial management information construction model. In order to improve the evaluation performance of financial data, this paper also constructed a financial data evaluation model based on support vector machine algorithm, and carried out relevant experimental research on the model. From the experimental results, in terms of the average financial risk value, the test result of this algorithm was 12.64, and the test result of the traditional algorithm was 17.88. In terms of average detection accuracy, the test result of the algorithm in this paper was 92.14%, and the test result of the traditional algorithm was 87.85%. From the data, it can see that the algorithm in this paper can effectively optimize the financial data evaluation model.

1. Introduction

There are many contents involved in financial management, among which financial data is the basic basis for financial management, so it is necessary to properly manage financial data. With the continuous expansion of business scale, economic activities are also more frequent. In the face of massive financial data, it is difficult for traditional data analysis and processing technology to effectively analyze and process it, resulting in low efficiency of financial data processing. It is also necessary to combine emerging technologies to improve the efficiency of financial data processing. With the help of scientific and technological forces, many emerging technologies have risen and been gradually applied in different industries. As one of the emerging technologies, CCT has

significant advantages in data analysis and processing. For large and complex data analysis and processing, it is often used. Therefore, it is of practical significance to apply CCT to financial management.

In recent years, the related content of finance has attracted extensive attention of the academic community, and scholars have launched research on it. Dyckhoff, Harald pointed out that the multi-criteria production theory can be used to expand the non-financial performance evaluation of knowledge theory and practice. By comparing with the traditional production theory, he confirmed the basic assumptions of the multi-criteria production theory, and its application provided effective reference for some procedures and defects of non-financial performance evaluation [1]. Akber, S. M conducted some research on the financial data of five Islamic banks and five traditional private commercial banks [2]. Saint, Veronica proposed a dynamic financial strategy model to simplify the financial decision-making process and solve the dilemma of formulating specific financial strategies. The main purpose of this model was to establish specific financial strategies and find theoretical and practical insights from the impact of financial changes on the overall financial strategy [3].

In order to evaluate the financial performance of private hospitals, Kourtis, Michael analyzed the financial statement data of 15 private hospitals in Greece and used it as the basis for evaluating the financial performance. The research results showed that the financial performance of the vast majority of hospitals in the sample showed an increasing and decreasing income trend [4]. Bashatweh, Ammar Daher aimed to analyze and evaluate the financial performance of the Bank of Jordan. With the help of CAMELS framework, he analyzed the financial data of 13 commercial banks. The analysis results show that the Jordanian Commercial Bank has generally reached the level of CAMELS framework to classify it [5]. Almeida-Filho, Adiel Teixeira de pointed out that multi-criteria decision-making/auxiliary models and methods are feasible options to deal with the complexity of financial decision-making and multi-objective. He focused on analyzing the main financial standards and multi-criteria decision-making/auxiliary methods used for financial decision-making to determine the applicability of these models in the financial field [6]. However, these scholars' research on finance is not comprehensive enough, and based on machine learning, the research on finance can play a good role.

The research on machine learning is very popular in all walks of life, and there are also relevant research reports on finance. Kamalov, Firuz used the 10-year historical data of 10 large American companies, and took the stock price and return in the financial forecast as the input characteristics to make a wide comparison. He used machine learning algorithm as the basis of the prediction model to predict the stock price and return. The results show that the stock price is a more effective independent input feature than the return [7]. Chen, Xi has built a financial forecasting model and used machine learning methods and high-dimensional detailed financial data to predict the direction of earnings changes a year ago. The annual scale adjustment rate of return of the hedging portfolio formed by its forecast was between 5.02% and 9.74%, and the rate of return has significantly improved [8]. In general, there are not many researches on machine learning and finance. In order to improve the relevant research of financial data and integrate machine learning and 5G (5th Generation Mobile Communication Technology) CCT, it is necessary to study the evaluation method of financial data.

This paper made a detailed analysis of the application status of CCT in financial management, and also analyzed the impact of this technology on enterprise financial management, and integrated this technology. This paper proposed two different financial management information models to meet the needs of different enterprises. In order to optimize the evaluation method of financial data, this paper also put forward several elements of financial data quality evaluation, and made a detailed comparison with traditional evaluation methods to highlight the scientific nature of this evaluation method. This could provide an effective reference for the evaluation of financial data.

2. 5G Cloud Computing Technology, Enterprise Financial Management and Quality Evaluation

2.1. 5G Cloud Computing Technology

The CCT used in 5G mobile communication technology can be divided into “cloud” and “computing”, as shown in Figure 1. “Cloud” refers to various software and hardware resources in the Internet server, and “computing” mainly refers to the analysis of data by Internet users based on CCT according to their personal needs. With this operation, it can effectively reduce the operating load of the local computer, thus improving the efficiency of users in processing data information, with more efficient network services for users.

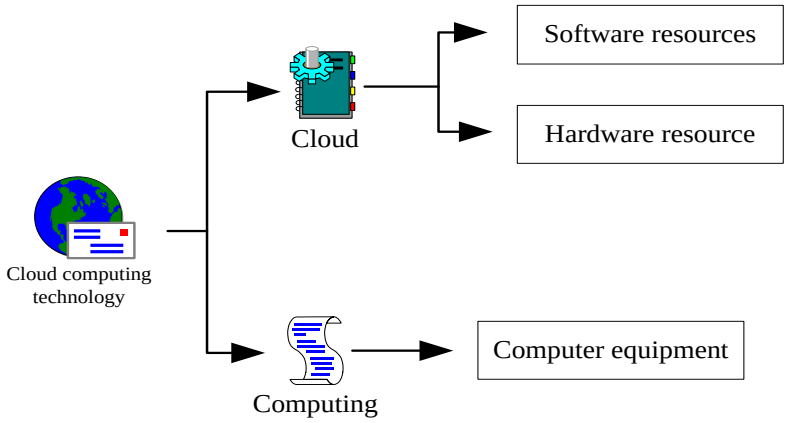

Figure 1 Cloud computing technology division

There are many emerging technologies in cloud computing, including virtualization technology, which plays a key role in cloud computing. In cloud computing, it includes a variety of infrastructure, which together build the framework of cloud computing[9]. Under virtualization, a virtual machine can be built to simulate and analyze relevant data information[10]. By following a certain management and operation process, the balanced and optimized configuration of multiple data resources can be realized, and the multiple computing functions of virtual machines can be fully utilized.

2.2. Financial Management Information Construction Mode Based on Cloud Computing Technology

2.2.1. Classification of Financial Management Informatization Construction Mode

Cloud computing technology can be applied to enterprise financial management, which is conducive to the optimization and upgrading of the overall technology of the enterprise. In today’s market, the competition is very fierce. In order to stand out among the tens of millions of enterprises, people need to constantly improve the overall strength of enterprises, promote the innovation of enterprise technology, and enhance competitive advantage[11]. Integrating CCT into the financial management model would help promote the informatization construction of enterprise financial management. The classification of its construction model is shown in Figure 2.

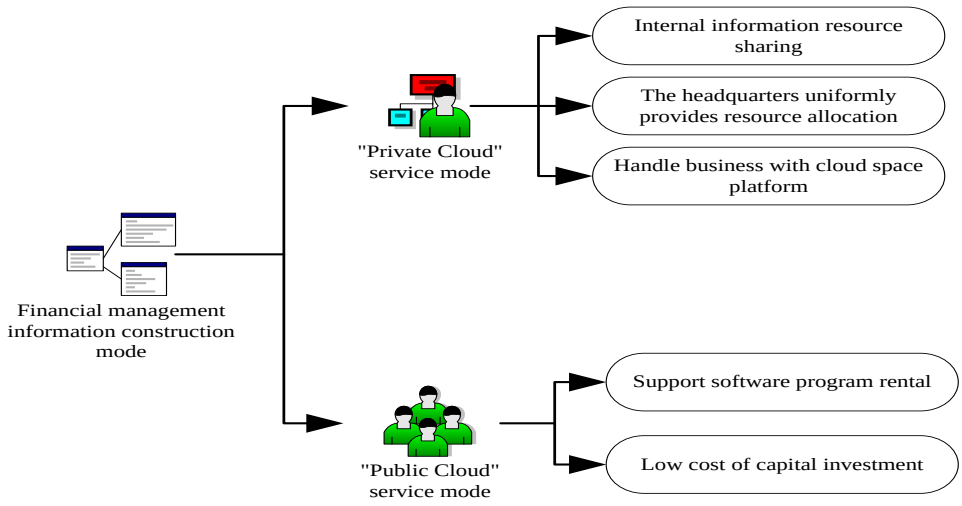

Figure 2 Classification of financial management informatization construction mode

(1) “Private Cloud” service mode

In this mode, the circulation and sharing of various information resources are only carried out within the enterprise, and are highly restrictive. Under this service mode, relevant technicians would build a special technical system and manage it. The operation mode of the system is also different. The headquarters uniformly allocates resources. With the help of virtual machines, build a data information platform, and the data information of each branch would be collected uniformly by the platform, and then collate and analyze these data, so that the headquarters can also understand the data of each branch.

Under the “private cloud” service mode, all staff are an independent branch of the system. When using the financial management system, they also need to use the data information of the “cloud space” platform to process the business [12]. Once the network is disconnected, the CCT would automatically trigger and continue to complete the financial calculation until the network returns to normal, and transfer the financial data to the system.

(2) “Public Cloud” service mode

For cloud computing dealers, it is mainly to optimize the design of online software mode in order to bring satisfactory service to users. These software programs are shared, and enterprises can rent these software programs for their own use. With the help of CCT, enterprises build a cloud computing system architecture, and then only need to invest appropriate human and material resources to maintain the financial management information software, thus reducing the investment of other funds. At the same time, it is also necessary to deal with the faults of the software program in time with the help of relevant facilities and technologies, so as to ensure the smooth operation of the software program and improve the operation efficiency of the software.

2.2.2. Role of Cloud Computing Technology in Financial Management Information Construction

All functions of cloud computing need to be completed with the help of "cloud". Data information storage, data analysis, data calculation, etc. are handled by "Cloud". Under CCT, the speed of obtaining and enabling financial management information has been significantly improved, and the efficiency of financial data processing has also been improved [13]. With the strong support of CCT and the Internet, enterprise financial information management can achieve orderly connection with dealers, thus improving the efficiency of information management.

When enterprises use Internet financial information, their way of handling financial work is also continuously improving, which can effectively reduce the cost of using information equipment. This way can reduce costs, which is the goal of enterprise information management. In this way, enterprises do not need to spend more money on purchasing products and equipment, as well as the losses caused by equipment upgrading, and can control production costs to the maximum extent, thus providing technical support for the implementation of information construction of enterprise financial management.

2.3. Practical Quality Evaluation of Enterprise Financial Data

2.3.1. Elements of Financial Data Quality Evaluation

In the evaluation of the quality of enterprise financial data, the elements included include the evaluation subject, the evaluation object, the evaluation principle and the evaluation method [14]. The elements form a system of interdependence, mutual promotion and checks and balances on the whole. The comparison of different types of financial data quality assessment is shown in Figure 3.

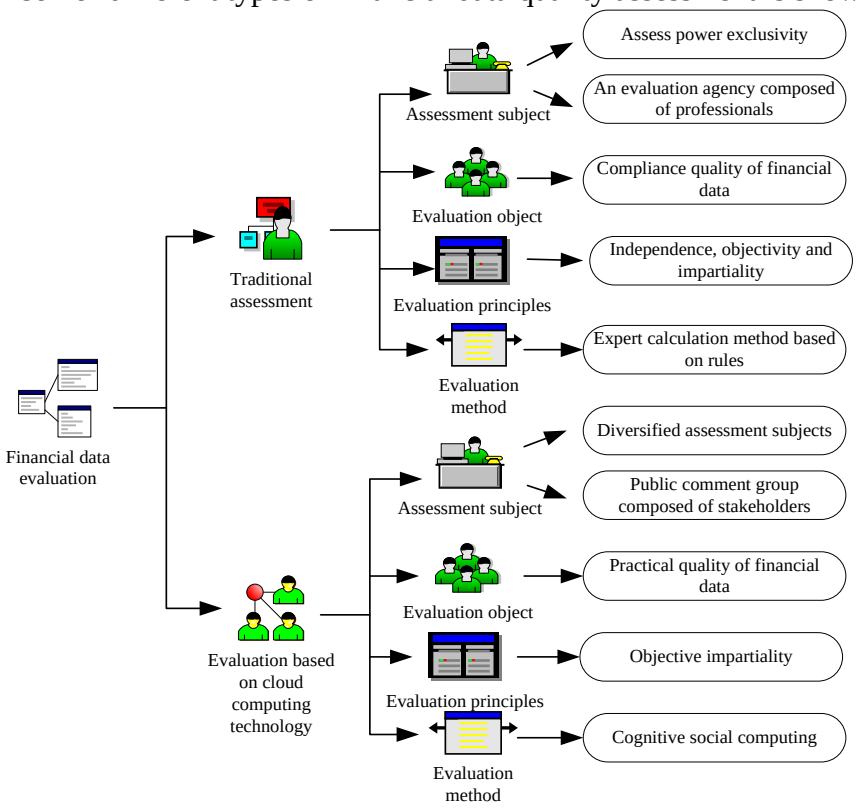

Figure 3 Comparison of different types of financial data quality assessment

(1) Assessment subject

The evaluation subject refers to the personnel who carry out the evaluation. The traditional evaluation work is usually carried out by professional organizations. Affected by the arbitrariness of the evaluation power, power rent-seeking often occurs. The evaluation subject based on cloud computing is usually a public evaluation team composed of professionals and users. The evaluation subject is more diversified, which can ensure that the evaluation results are more fair and equitable.

(2) Evaluation object

The evaluation object refers to the object to be evaluated, that is, the quality type of enterprise financial data. The traditional evaluation method can only provide notarized information about the

compliance quality of enterprise financial data, but cannot provide practical quality information. However, users are most concerned about practical quality information. Based on the evaluation object of cloud computing, the enterprise financial data provided by it is practical quality information, and its evaluation work is also open to users.

(3) Evaluation principles

The evaluation principles refer to the principles that should be adhered to and followed by the evaluation behavior and evaluation work. The practical quality assessment based on cloud computing should always adhere to the principles of public comment, universality and scientificity. Public evaluation means that the evaluation of the practical quality of the enterprise's financial data information should be conducted by the personnel related to its interests as the judges, which can better guarantee the authenticity and fairness of the evaluation results, which is also different from the traditional evaluation.

(4) Evaluation method

Affected by the changes in the subject, object and principle of the assessment, the assessment method has naturally changed. The traditional evaluation is based on the accounting standards, with the help of measurement and statistical analysis knowledge, to calculate the financial index data of compliance quality, and then obtain the evaluation results. This evaluation method is called rule-based expert calculation method. The evaluation based on cloud computing is more democratic and scientific, mainly evaluating the practical quality of financial data. The evaluation method is subjective and the judgment results vary from person to person.

2.3.2. Financial Data Quality Evaluation Mode

(1) Identification and classification management of assessment subjects

In order to ensure the authenticity and fairness of the evaluation results, it is also necessary to use the evaluation system to identify and classify the evaluation subjects. Due to the different motivations of the evaluators, the emphasis of expressing opinions is also different. The evaluation system needs to understand and analyze the evaluators, grasp their characteristics, and classify them according to their characteristics. At the same time, it is also necessary to have the ability to identify the network water force to prevent the evaluation results from being unfair. In essence, it is particularly important to analyze and supervise the integrity of the evaluator. Because the evaluator has good integrity, it is more conducive to the orderly development of the evaluation work.

In order to understand the motivation of participants, the evaluation system software needs to carefully analyze the basic information and behavior data of participants, and establish a data collection of participants. Then, according to the characteristics of the data set, the evaluation system can select an appropriate way to effectively screen the participants and analyze their behavior characteristics. On this basis, the participants can be graded in good faith, and finally the participants can be supervised according to the level.

(2) Use and standardization of intelligent technology

In the Internet environment, the application of intelligent technology is also more convenient. The interconnection function of the Internet makes it more convenient for the masses to participate in the evaluation activities; The application of CCT makes the data information available to the evaluation system more comprehensive, thus providing more support for data processing. Under the Internet information security management mechanism, the evaluation quality has also been greatly improved. Under the conditions of the Internet, the evaluation work needs to collect, classify and calculate the data stream, and some intelligent technologies need to be applied.

3. Financial Data Evaluation Model Based on Support Vector Machine

3.1. Support Vector Machine

Support vector machine is a branch algorithm of machine learning algorithm, which can effectively get rid of the over-fitting phenomenon of traditional methods. This algorithm has good generalization ability. Support vector machines can also obtain small errors in limited training samples, and at the same time, they can effectively ensure that the individual verification set also has relatively small errors.

In this paper, a financial data evaluation model is established by integrating support vector machines, and the performance of the model is optimized by using simulation examples, so as to provide a certain basis for enterprise financial data evaluation [15].

Linear separable samples can be analyzed as follows:

$$(a_j, b_j), j = 1,2,3, \cdots, q, a_j \in w_m, b_j \in \{-q, q\} \tag{1}$$

The linear discriminant function of its high-dimensional attribute space is:

$$e(a) = r \cdot a + t \tag{2}$$

The hyperplane equation is:

$$r \cdot a + t = 0 \tag{3}$$

In the formula, r represents the hyperplane normal and t represents the threshold.

The purpose of the optimal classification hyperplane is to find the solution that maximizes the classification examples, and at the same time, to classify all samples accurately. Therefore, the problem of searching for the best classification hyperplane is transformed into a solution problem of increasing constraint constraints:

$$\min\beta(\delta) = \frac{1}{2}\|r\|^2 \tag{4}$$

$$s.t.\, b_j[r \cdot a_j + y] \geq 1, j = 1,2, \cdots, u \tag{5}$$

By introducing the relaxation variable and penalty factor into formulas (4) and (5), people can obtain the solution of the optimal classification hyperplane problem under the condition of linear indivisibility. The formulas are:

$$\min\beta(\delta) = \frac{1}{2}\|r\|^2 + g\sum_{j=1}^{u}\mu_j \tag{6}$$

$$s.t.\, b_j[r \cdot a_j + y] \geq 1 - \mu_j, j = 1,2, \cdots, u \tag{7}$$

In the formulas, $g\sum_{j=1}^{u}\mu_j$ represents the maximum number of centralized mis-scoring samples, and s represents the punishment degree of mis-scoring samples.

Fusion support vector machine is to build a financial evaluation model. First, it needs to select training sets from the data, then select test sets from these training sets, and then preprocess and normalize these data sets. It checks whether the data is trained by reading the data. Then it is to train and learn the training set data, and constantly optimize and adjust the learning parameters to obtain the best classification function and training model. Finally, the model can be used to evaluate the financial risk of the test set data. The financial data evaluation process based on support vector machine is shown in Figure 4.

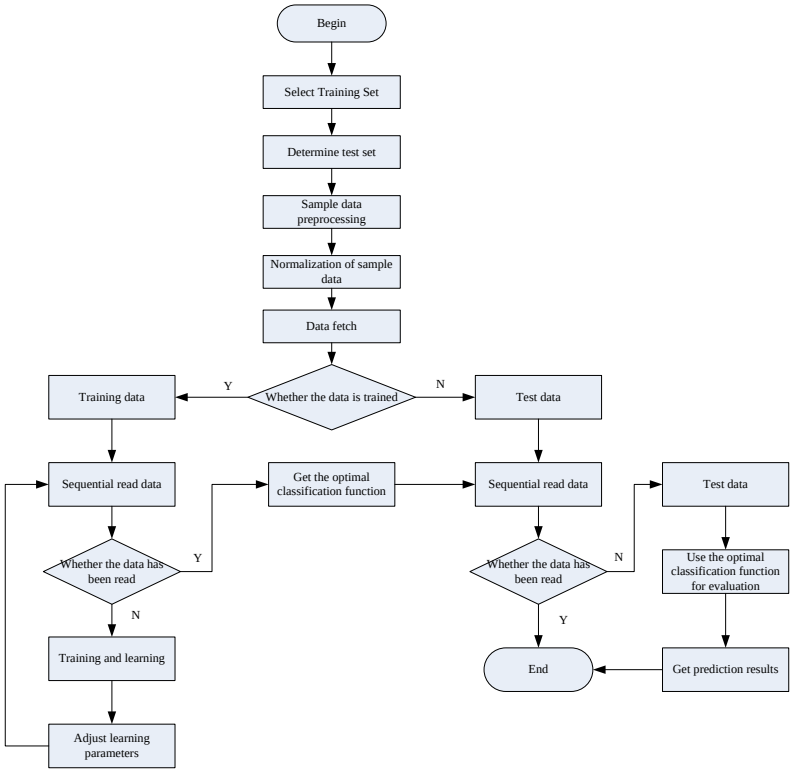

Figure 4 Financial data evaluation process

3.2. Experiment of Financial Data Evaluation Model

This paper collected the financial data information of an enterprise in recent years from the Internet, and generated the corresponding five sets of data. At the same time, this paper combined with the support vector machine algorithm to test the five sets of data sets, and also used the traditional algorithm to carry out comparative experiments.

3.2.1. Financial Risk Value Test

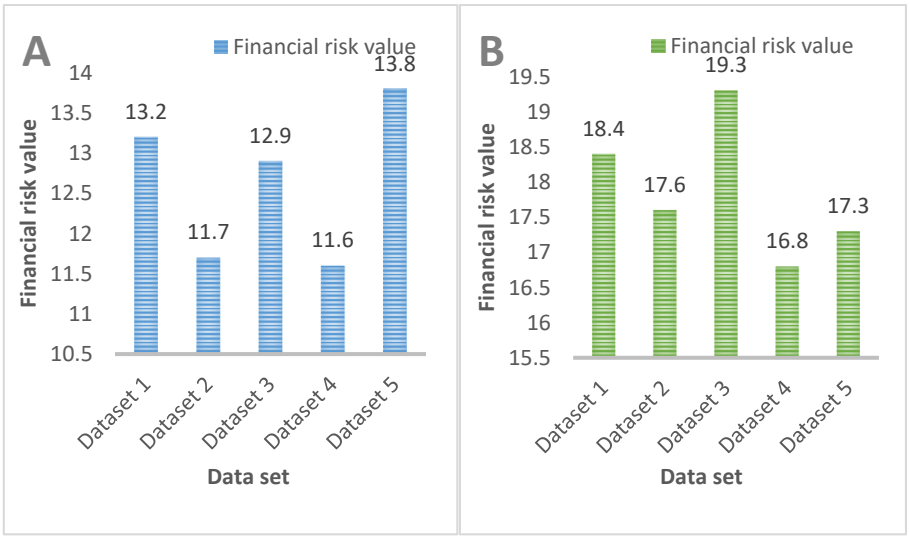

Figure 5 Model financial risk value test under different algorithms

In order to effectively evaluate the performance of the model, this paper uses two algorithms to test and analyze several sets of data sets from the perspective of financial risk value, and the test results are shown in Figure 5.

Figure 5A shows the financial risk value test of the model under this algorithm

Figure 5B shows the financial risk value test of the model under the traditional algorithm

It can be seen from Figure 5 that the two algorithms have certain differences in the test results of financial risk value of each group of data sets. In Figure 5A, data set 4 has the lowest financial risk value of 11.6. Data set 5 has the highest financial risk value of 13.8, and the average risk value of five data sets can be calculated as 12.64. In Figure 5B, the financial risk value of data set 4 is the lowest, 16.8, 19.3 and 17.88 respectively.

3.2.2. Detection Accuracy Test

In order to further compare the differences between the two algorithms, this paper also tested and analyzed each group of data sets in terms of detection accuracy, and the specific results are shown in Figure 6.

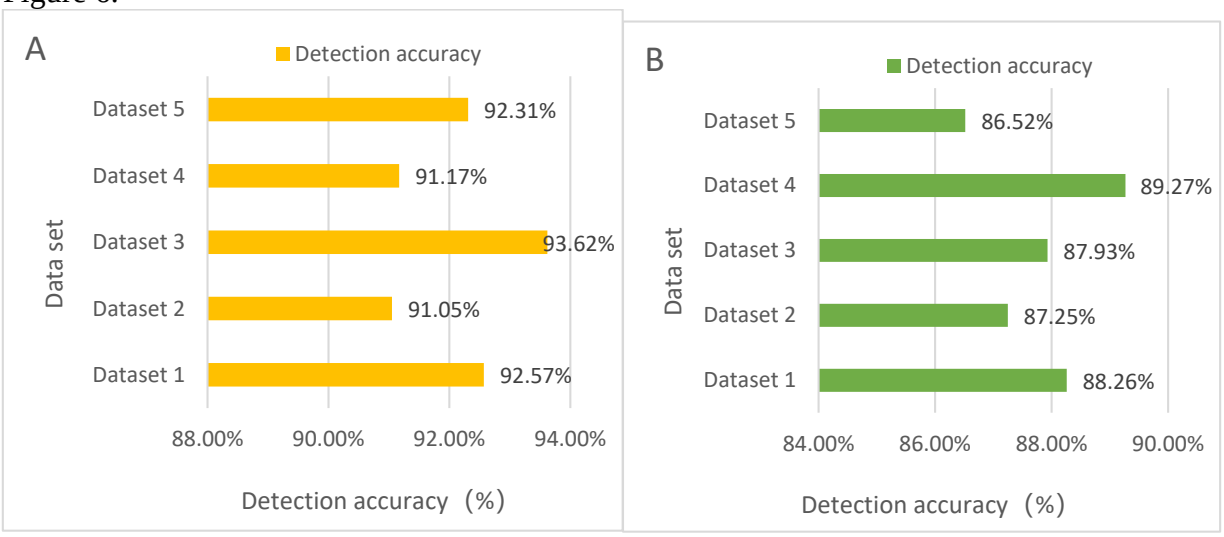

Figure 6 Model detection accuracy test under different algorithms

Figure 6A shows the model detection accuracy test under this algorithm

Figure 6B shows the model detection accuracy test under the traditional algorithm

In Figure 6A, the detection accuracy of each data set remains above 90% as a whole. It can be seen that the detection accuracy is generally high, and the detection accuracy of data set 2 is the lowest, 91.05%. Data set 3 has the highest detection accuracy, 93.62%, and the average detection accuracy of each data set is 92.14%. In Figure 6B, the detection accuracy of different data sets would be lower, basically maintaining below 90%, and the detection accuracy of data set 5 is the lowest, 86.52%. Data set 4 has the highest detection accuracy of 89.27%, and the average detection accuracy of five data sets is 87.85%.

4. Conclusions

In enterprise financial management, analyzing and evaluating large, complex financial data poses challenges for traditional methods. To address this, this paper applies CCT to financial management and builds a financial management information model. It also proposes a financial data evaluation model based on the support vector machine (SVM) algorithm. Experimental results show that the algorithm reduces financial risk values, enhances detection accuracy, and improves evaluation

performance, indicating improved data security. Future research will focus on optimizing the SVM algorithm to better meet application needs and further support enterprise financial management and data evaluation.

References

[1] Dyckhoff, Harald. "Multi-criteria production theory: foundation of non-financial and sustainability performance evaluation." Journal of Business Economics 88.7-8 (2018): 851-882.

[2] Akber, S. M., and Asha Dey. "Evaluation of the financial performance between traditional private commercial banks and Islamic banks in Bangladesh." International Journal of Islamic Banking and Finance Research 4.2 (2020): 1-10.

[3] Saint, Veronica. "Proposal and simulation of dynamic financial strategy model." Future Studies Research Journal: Trends and Strategies 11.1 (2019): 84-101.

[4] Kourtis, Michael. "A strategic financial management evaluation of private hospitals' effectiveness and efficiency for sustainable financing: a research study." European Research Studies 24.1 (2021): 1025-1054.

[5] Bashatweh, Ammar Daher, and Emad Yousif Ahmed. "Financial Performance Evaluation of the commercial banks in Jordan: Based on the CAMELS Framework." International Journal of Advanced Science and Technology 29.5 (2020): 985-994.

[6] Almeida-Filho, Adiel Teixeira de, Diogo Ferreira de Lima Silva, and Luciano Ferreira. "Financial modelling with multiple criteria decision making: A systematic literature review." Journal of the Operational Research Society 72.10 (2021): 2161-2179.

[7] Kamalov, Firuz, Ikhlaas Gurrib, and Khairan Rajab. "Financial forecasting with machine learning: price vs return." Kamalov, F., Gurrib, I. & Rajab, K.(2021). Financial Forecasting with Machine Learning: Price Vs Return. Journal of Computer Science 17.3 (2021): 251-264.

[8] Chen, Xi. "Predicting future earnings changes using machine learning and detailed financial data." Journal of Accounting Research 60.2 (2022): 467-515.

[9] Wayant, Cole. "Evaluation of financial conflicts of interest among physician-authors of American College of Rheumatology clinical practice guidelines." Arthritis & Rheumatology 72.9 (2020): 1427-1434.

[10] Roy, Shuvashish, and Arindam Das. "Application of TOPSIS method for financial performance evaluation: a study of selected scheduled banks in Bangladesh." Journal of commerce and accounting research 7.1 (2018): 24-29.

[11] Friedman, Sarah A. "The Mental Health Parity and Addiction Equity Act evaluation study: impact on mental health financial requirements among commercial "carve-in" plans."Health services research 53.1 (2018): 366-388.

[12] Hehenberger, Lisa, and Anna-Marie Harling. "Moving toward "impact-adjusted" financial returns: Closing remarks." American Journal of Evaluation 39.3 (2018): 408-412.

[13] Daryanto, Candraditia, and Wiwiek Mardawiyah Daryanto. "Financial performance analysis and evaluation of pharmaceutical companies in Indonesia." International Journal of Innovation, Creativity and Change 6.3 (2019): 207-224.

[14] Xing, Frank Z., Erik Cambria, and Roy E. Welsch. "Natural language based financial forecasting: a survey." Artificial Intelligence Review 50.1 (2018): 49-73.

[15] Landau, Alexander. "Integrated reporting of environmental, social, and governance and financial data: Does the market value integrated reports?" Business Strategy and the Environment 29.4 (2020): 1750-1763.